CARE PLANNING

Mechanical Ventilation Invasive

Setting: **Inpatient** Population: **NICU** Keywords: **ventilator associated pneumonia, device, VAP, ventilator, vent, breathing**

Clinical Description

Care of the hospitalized infant experiencing the need for controlled or assisted breathing through an artificial airway.

Key Information

- Artificial airways used in infants are generally cuffless because the narrowest portion of the cricoid cartilage acts as the cuff within smaller airways.
- To reduce the risk of pulmonary aspiration, a swallow evaluation should be performed prior to oral intake or feeding.
- Neonatal-sized and pediatric-sized tracheostomies should be changed on a regular schedule to prevent obstruction of the single lumen cannula.
- Small airways and smaller diameter tubes are less compatible with speaking valves and tracheostomy plugs or caps due to increased resistance around the tube during exhalation. This increases the risk of airflow obstruction.

Clinical Goals

By transition of care

A. The patient will demonstrate achievement of the following goals:

- Effective Communication
- Optimal Device Function
- Absence of Device-Related Skin or Tissue Injury
- Absence of Ventilator-Induced Lung Injury

B. Patient, family or significant other will teach back or demonstrate education topics and points:

- Education: Overview
- Education: Self Management
- Education: When to Seek Medical Attention

Correlate Health Status

Correlate health status to:

- prenatal and birth history, comorbidity, congenital anomaly
- gestational age, corrected age, day of life
- sex
- baseline assessment data
- physiologic status
- response to medication and interventions
- barriers to accessing care and services
- family/caregiver:
  - developmental level
  - health literacy
  - cultural and spiritual preferences
- safety risks
- social determinants of health
- family interaction
- plan for transition of care

Communication Impairment (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- agitation
- artificial airway present inhibiting vocalization
- irritability
- soundless crying

Problem Intervention(s)

Ensure Effective Communication

- Acknowledge and validate intensity and complexity of infant's voicelessness and the inability of the parent/caregiver to hear the infant cry.
- Encourage seeing, touching, holding, skin-to-skin contact and response to infant cues, other than sound, to identify needs.
- Decrease parent/caregiver anxiety; provide honest and accurate information; encourage expression of feelings and participation in care.
- If longer-term airway, consider alternative communication methods that facilitate verbal sounds.

Associated Documentation

- Psychosocial Support

Device-Related Complication Risk (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- air auscultated in stomach
- airflow out of mouth
- breath sounds unequal
- chest movement asymmetrical
- difficulty passing suction catheter
- excessive cough
- gastric distension
- gurgling sound from throat
- inability to ventilate
- mechanical ventilation with an artificial airway
- no airflow from device
- restlessness
- upper airway sounds increased
- work of breathing increased

Vital Signs

- heart rate increased
- respiratory rate increased
- SpO2 (peripheral oxygen saturation) decreased
- TcCO2/TcO2 (transcutaneous carbon dioxide/oxygen) outside desired range

Laboratory Values

- PaCO2 (arterial carbon dioxide) increased
- PaO2 (partial pressure of arterial oxygen) decreased

Diagnostic Results

- CXR (chest x-ray) abnormal

Problem Intervention(s)

Optimize Device Care and Function

- Maintain head of bed elevation to minimize the risk of aspiration.
- Provide oral care regularly with subglottic suction to reduce the risk of infection; perform prior to tube manipulation.
- Assess tube size, depth, location and securement frequently to minimize the risk of tube displacement; regularly confirm placement with radiography or ultrasonography.
- Facilitate regular mechanical ventilator and humidification equipment checks to ensure proper function; monitor and manage ventilator and alarm settings.
- Provide humidification and evaluate need for suctioning to minimize risk of airway obstruction; regularly replace closed in-line suction equipment.
- Perform ongoing tracheostomy and stoma care to prevent infection; minimize excessive moisture around device ; replace tracheostomy regularly to prevent obstruction from secretions.
- Provide emergency equipment that includes appropriate-sized manual resuscitation bag, mask, suction equipment and cleaning supplies; replace device or assist breathing if displacement occurs.

Associated Documentation

- Airway Safety Measures

Skin and Tissue Injury (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- bleeding
- hoarse cry
- laceration
- localized swelling
- redness
- skin blanching
- skin integrity disrupted
- stoma granulation
- stridor
- tracheal granuloma

Problem Intervention(s)

Maintain Skin and Tissue Health

- Monitor depth of suction catheter advancement to minimize the risk of internal tracheobronchial tissue injury.
- Reposition and resecure endotracheal tube regularly; ensure proper tube location.
- Monitor tightness of securement device, as well as skin and mucosal areas, regularly; consider skin barrier protection.
- Minimize pressure points and avoid traction on device; consider flexible extenders or props.
- Assess and monitor for the presence of bleeding that may indicate injury to tracheobronchial tissue. Notify provider for persistent bleeding.
- Anticipate the need for further treatment or procedure, if bleeding persists.
- Anticipate adjunct therapy, such as cool mist, racemic epinephrine, corticosteroid or heliox, for symptoms related to airway swelling or stridor after removal of tube.

Associated Documentation

- Device Skin Pressure Protection

Ventilator-Induced Lung Injury (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- lung compliance decreasing
- oxygenation requirements increasing (e.g., FiO2 or positive end expiratory pressure needs)
- ventilatory requirements increasing (e.g., minute volume, respiratory rate)

Vital Signs

- heart rate increased
- respiratory rate increased
- blood pressure increased or decreased
- SpO2 (peripheral oxygen saturation) decreased
- TcCO2/TcO2 (transcutaneous carbon dioxide/oxygen) outside desired range

Laboratory Results

- oxygen index increased
- PaCO2 (arterial carbon dioxide) increased
- PaO2 (partial pressure of arterial oxygen) decreased

Diagnostic Results

- CXR (chest x-ray) abnormal

Problem Intervention(s)

Facilitate Lung-Protection Measures

- Provide oxygen therapy judiciously to maintain oxygenation goals; adjust to avoid hyperoxemia and oxygenation fluctuation.
- Maintain low inspiratory time to minimize barotrauma.
- Monitor and limit ventilator tidal volumes to minimize volutrauma; initiate low tidal-volume strategy (e.g., 4 to 6 mL/kg).
- Monitor and limit ventilator inspiratory pressure to reduce risk of barotrauma.
- Apply PEEP (positive end expiratory pressure) to minimize atelectasis; adjust for changes in lung compliance and oxygenation.
- Monitor fluid balance closely to minimize the risk of fluid overload.
- Monitor ventilator waveforms and promote patient-ventilator synchrony; adjust ventilator settings and sedation.

Prevent Ventilator-Associated Pneumonia

- Assess readiness to spontaneously breathe and extubate.
- Maintain head of bed elevation to minimize aspiration risk; consider lateral recumbent, reverse Trendelenburg and prone position.
- Provide ongoing oral care to reduce pathogens in oral cavity.
- Minimize ventilator circuit breaks; consider use of closed suction device.

Associated Documentation

- Lung Protection Measures

Associated Documentation

- Positioning, Body (Developmental Care)
- VAP Prevention Bundle

General Education

- admission, transition of care
- orientation to care setting, routine

- advance care planning
- diagnostic tests/procedures
- opioid medication management
- oral health
- medication management
- pain assessment process
- safe medication disposal
- tobacco use, smoke exposure
- treatment plan

Safety Education

- call light use
- equipment/home supplies
- fall prevention
- harm prevention
- infection prevention
- MDRO (multidrug-resistant organism) care
- personal health information
- resources for support

Education: Overview

- description
- indications

Education: Self-Management

- CPR education
- VAP prevention

Education: When to Seek Medical Attention

- unresolved/worsening symptoms

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